

In re Patent Application of:

AMMAR

Serial No. **09/862,982**

Filing Date: **May 22, 2001**

REMARKS

Claims 1-15 remain in this application. Claims 16-20 have been previously cancelled. Claims 1 and 10 are amended.

Applicant thanks the Examiner for the detailed study of the application and prior art and for the cordial telephone conference granted to the undersigned attorney on October 4, 2004.

As noted in that conversation, the present invention is directed to a simplified package for a single microwave monolithic integrated circuit as shown in FIGS. 2A, 2B and 2C of the instant application. The MMIC chip package of the present invention is a non-hermetic package in which the MMIC chip has chip input and output pads and DC pads, for example, pads used for the gate and drain of the MMIC chip. As shown in FIGS. 2A, 2B and 2C, these pads are exposed to atmosphere in the final chip package.

Independent claims 1 and 10 have been amended to delete the language regarding the exterior circuit board and the interconnects attached to the pads on the MMIC. Also, the independent claims have been amended to stress that a plurality of pads are formed on a single MMIC and form chip input and output pads and DC pads as set forth in the detailed description and drawings. The chip cover has openings and covers the MMIC to form a MMIC package that can be automatically picked and placed. The base plate and chip cover are configured with respective portions that engage each other, such that the chip input and output and DC pads on the MMIC are directly exposed to atmosphere through openings of the chip cover for wire and ribbon bonding. This is

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specifically shown in FIGS. 2A, 2B and 2C, which show the gap and exposure to atmosphere by this MMIC chip package of the present invention, and thus, no new matter has been added.

Thus, it is very clear that the present claimed invention is not directed to a hermetically sealed package where a MMIC chip is positioned on a circuit board and the entire board, including the MMIC chip, is sealed by a metallic housing or resin as in the cited prior art.

Applicant notes that the Examiner has rejected claims 1-3 and 6-15 as obvious over U.S. Patent No. 6,064,286 to Ziegner et al. (hereinafter "Ziegner") in view of U.S. Patent No. 5,932,927 to Koizumi et al. (hereinafter "Koizumi"), in view of U.S. Patent No. 5,135,890 to Temple et al. (hereinafter "Temple").

Applicant notes even these references do not disclose or suggest, either singularly or in combination, the claimed invention. The three cited references are directed to sealed packages. Any pads on their chips are not exposed to atmosphere by their packaging. The secondary Temple reference, for example, specifically discusses in its Background section as prior art hermetic (gas-tight) packages.

Temple notes that it has been customary for hermetic packages to mount unpackaged chips on a substrate and form a hybrid circuit. This entire substrate (and chips mounted thereon) are sealed together in a metallic hermetic package. This teaching in Temple is similar to what the primary Ziegner reference discloses, in which a substrate board supports a MMIC chip, as shown in its FIG. 2, within a hermetically sealed package 24. This use of the hermetically sealed

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package in Ziegner is the reason why Ziegner requires the use of intermediate connectors 26 and spring clips 78.

In Ziegner, the MMIC chip is placed on a glass substrate with other mounted components. Conductive traces are used to interconnect the chip with different mounted components, including those contacts that extend beyond its cover acting as an enclosure to the entire circuit board. This cover in Ziegner can be epoxied over the entire hybrid circuit and form a seal that encloses the board or substrate.

Thus, the Ziegner package forms a metallic cover over an entire circuit board, including the MMIC chip attached to the circuit board. Traces from the MMIC chip extend along the circuit board and connect to intermediate contacts 26 that extend outside the package. Ziegner is opposite from the present claimed invention. In the present invention, the chip cover has openings and the chip input and output and DC pads are directly exposed to atmosphere through openings of the chip cover for wire and ribbon bonding. There is no hermetic seal and no intermediate contacts.

As to the cited Koizumi, it also discloses a chip package for a Microwave Integrated Circuit or Microwave Monolithic Integrated Circuit (MIC or MMIC) in which a circuit board (formed as a film circuit board) includes connections that contact MMIC chip pads and extend outside the perimeter of the circuit board. The MMIC chip package is entirely covered with a resin 7. Thus, this MMIC chip package in Koizumi has no MMIC pads that are exposed to atmosphere, and instead all pads are covered with resin. MMIC pads are attached to leads, however, that extend from the MMIC chip outward through the resin to act as electrodes.

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Thus, both Ziegner and Koizumi teach opposite from the present claimed invention and require some type of a hermetically sealed package that covers completely the entire MMIC, such that all pads are sealed, as compared to the present claimed invention, in which the MMIC chip pads that form the chip input and output and DC pads are exposed to atmosphere as clearly shown in FIGS. 2A, 2B and 2C and allow wire and ribbon bonding after the package has been picked and placed onto a board.

The Examiner argues that Temple teaches a package as a semiconductor device with contact pads 16/18 and conductive spheres, apertures 52, and a template. The examiner further argues that Temple discloses an aperture in the lid or chip cover for packaging the device, and therefore, it would be obvious to have pads on a MMIC directly exposed to openings of the chip cover for wire and ribbon bonding.

Applicant notes that Temple is specifically directed to a hermetically sealed package. Again, this is opposite from the present claimed invention. The MMIC chips or its pads are not exposed in Temple, but instead, are contacted through the spheres 62 located in the apertures 52. Indeed, if Temple taught the present claimed invention, there could be no use of spheres 62. Instead, the apertures 52 would remain open. Temple, on the other hand, teaches a lead that contacts the MMIC chip and extends vertically through the lid (column 2 starting at line 60). A conductive foil, such as copper, is bonded to the ceramic body of the lid, and extends across each of the apertures. It provides a hermetic seal around those apertures, and is preferably dimpled where it extends across an aperture in which a conductive pellet is disposed. These

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pellets are disposed in the apertures and electrically continuous with the contact pads on the semiconductor device and preferably spaced from the aperture walls. This package is sealed.

Thus, Temple teaches away from the present claimed invention in which MMIC chip pads are exposed to atmosphere for wire and ribbon bonding after the MMIC chip is picked and placed onto a circuit board. In Temple, the hermetically sealed package would be separately positioned on a board and contacts made to any exterior connectors 98 that connect to conductors of the conductive spheres, as clearly shown in Temple FIG. 13.

It is clear, then, that the cited Ziegner, Koizumi and Temple references teach opposite from the present claimed invention, and teach the use of sealed packages. Chip pads are not exposed for direct wire and ribbon bonding in any three references, but instead, are sealed in some type of package and connected to outside circuits via another conductor that is connected to a pad and sealed within a package, whether the package is a metallic or resin cover.

As to the cited U.S. Patent No. 5,596,171 to Harris, it shows a plastic cover, but teaches opposite from the present claimed invention because in Harris wires are bonded to the package conductor pads, which are not directly exposed to atmosphere as in the present claimed invention. Column 4, starting at line 9 of Harris specifically teaches that pads are precisely located using photo-resist. A wire 112 electrically connects the die 110 to pads 114 to enable the die to be electrically connected to an external circuit by the conductors 106. Epoxy 116 is used to bond the package base

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102 and the lid 104 to seal the package 100 from the environment. Thus, the pads are not exposed and are protected using the intermediate wires as conductors as compared to the present claimed invention in which MMIC chip pads are exposed to atmosphere as shown in FIGS. 2A, 2B and 2C and taught by the specification.

As to cited U.S. Patent No. 4,359,754 to Hayakawa et al. (hereinafter "Hayakawa"), semiconductor elements are connected in parallel and use an AuSn solder. In Hayakawa, a package base has electrode sections and bonding pads connected to each other as shown in FIG. 2 with leads 7 to act as intermediate leads. Hayakawa is directed to the specific purpose of stabilizing operation of semiconductor devices so that self-oscillation does not occur. Intermediate bonding wires are used to bond pads of a chip.

It is clear that the cited prior art either singularly or in combination discloses or suggests the present claimed invention. At most, the prior art in combination would suggest a MMIC chip package that includes a single MMIC chip. The package would completely encase the MMIC chip, including any pads. Some type of conductive wire or intermediate contact would engage each pad and extend outside the sealed MMIC chip package to act as terminals for the package. This is much different from the present claimed invention in which the exposed MMIC chip pads act as the terminals and are connected directly to a board, for example, by wire bonding.

Applicant contends that the present case is in condition for allowance and respectfully requests that the Examiner issue a Notice of Allowance and Issue Fee Due.

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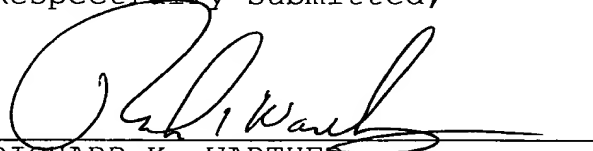
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If the Examiner has any questions or suggestions for placing this case in condition for allowance, the undersigned attorney would appreciate a telephone call.

Respectfully submitted,



RICHARD K. WARTHER

Reg. No. 32,180

Allen, Dyer, Doppelt, Milbrath
& Gilchrist, P.A.

255 S. Orange Avenue, Suite 1401

Post Office Box 3791

Orlando, Florida 32802

Phone: 407-841-2330

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: **MAIL STOP AF, COMMISSIONER FOR PATENTS, P.O. BOX 1450, ALEXANDRIA, VA 22313-1450**, on this 12th day of October, 2004.

